aptic release of acetylcholine from the nerve ending, thereby functionally denervating muscle fibers for weeks to months. Chemical denervation of the vocalis-thyroarytenoid muscle is accomplished by percutaneous localization of the muscle using a hollow electromyographic electrode followed by the administration of a small amount (0.1 to 0.3 ml) of toxin. Initially patients may experience hoarseness and aspiration that subsides in 36 to 48 hours, and increased fluency ensues. Vocal fluency should continue for three to six months, after which the injections can be repeated. In contrast to surgical treatment, both vocal cords can safely be treated eliminating failure due to the functioning cord. Although systemic effects appear subclinical at the present dosage, the long-term effects of the toxin in the larynx are unknown. Studies show that many patients feel the effect of the toxin to be preferable to other pharmacologic therapy. Most patients return for reinjection before their symptoms return. Further study is necessary, but it appears that botulinum toxin is an important new treatment option for patients with debilitating spastic dysphonia.

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Craniofacial Resection for Cancer

IN THE PAST, patients with advanced paranasal sinus neoplasms involving the anterior skull base had a dismal prognosis, and the lesions were generally considered unresectable. In the 1950s, extensive procedures were developed to remove these tumors, yet the outcome of surgical treatment was nearly as bleak as from the tumor, with most patients suffering significant morbidity. Now there is new hope for these patients with the current methods of surgical resection.

There are several reasons for the increased acceptance and success of craniofacial resection. Previously unresectable lesions are now surgically approachable, thanks to new technology and improved surgical techniques. With the progress of computed tomography and magnetic resonance imaging, lesions may be diagnosed while they are smaller and more resectable. Precise anatomic localization has permitted a better selection of surgical candidates and more detailed preoperative planning. Perioperative morbidity and mortality have been substantially decreased to acceptable levels (10% to 15% and less than 5%, respectively) with recent advances in intraoperative and postoperative monitoring techniques. Innovations in reconstructive techniques have allowed improved rehabilitation and reduced the risk of cerebrospinal fluid leaks and other complications. It is important for practitioners to be aware that such a procedure is now available to counsel patients appropriately.

Indications for craniofacial resection include malignant tumors arising from the nasal cavity, maxillary antrum, ethmoid-sphenoid complex, or orbit and extending to or through the cribriform plate. Investigators have found that even patients with some intracranial invasion often do well with this operation. Most candidates for craniofacial resection have already failed other forms of therapy, such as more limited surgical procedures or irradiation or both. Tumor types most commonly include squamous carcinoma, adenocarcinoma, esthesioneuroblastoma (olfactory neuroblastoma), and sarcoma. The best local control is achieved in well-differentiated squamous carcinoma and adenocarcinomas.

In this surgical approach, wide access is gained to the complex structures of the anterior skull base by a coronal flap and frontal craniotomy in combination with a facial incision. The cribriform plate and adjacent dura are removed en bloc with the ethmoid sinuses, nasal contents, and other involved structures such as the orbit or maxilla. The dura is repaired with fascia, the floor of the cranial fossa is reconstructed with a pericranial flap, and the nasal portion of the defect is lined with a skin graft. The cosmetic result is excellent. This is an oncologically sound en bloc procedure, and several series have now shown at least a three- to five-year disease-free survival in about half of these previously "incurable" patients.

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Intraoperative Facial and Auditory Nerve Monitoring

THE GENERAL PRINCIPLES underlying intraoperative monitoring of patients have been well established in anesthesiology: to provide an ongoing record of some physiologic function, to alert the surgeon when an undesirable change in that function occurs, and to provide feedback as to the efficacy of corrective measures that were taken. Through the development of specialized electrophysiologic monitoring techniques, preserving auditory and facial nerve function during surgical treatment in the posterior cranial fossa is becoming more the standard than the hoped-for exception of previous years. Moreover, these goals can be achieved noninvasively and without significantly delaying the operation.

Monitoring of the facial nerve is useful in the following: identifying surgical trauma to the nerve early, enabling the immediate notification of the surgeon; distinguishing facial nerve from adjacent nerves or from surrounding tissue or tumor; facilitating tumor removal by electrically mapping regions of the tumor for the presence of facial nerve; confirming nerve stimulatability following tumor removal in order to predict postoperative facial nerve function; and identifying the site and degree of neural degeneration in patients explored for possible facial nerve neoplasm or decompression of acute facial paralysis. Monitoring of facial function is carried out using standard electromyographic recording techniques with needle electrodes placed in the periorbital and perioral musculature. Facial nerve activity following stimulation, either unintentional as the result of trauma, or intentional using a hand-held stimulator, is monitored visually on a screen or routed to an audio amplifier for immediate feedback to the surgeon. The predictive efficiency for facial nerve function a year after the operation has been reported to be as high as 88%.

Monitoring auditory nerve integrity is accomplished using standard techniques for evoking the auditory brain-